

Remarks

In the outstanding Official Action, the Examiner:

(1) rejected claim 18 under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention;

(2) rejected claims 1, 3, 4 and 18 under 35 USC 102(b) as being anticipated by Townsend (U.S. Patent No. 5,388,480) ("Townsend");

(3) rejected claim 2 under 35 USC 103(a) as being unpatentable over Townsend;

(4) rejected claims 5, 14-17 and 19 under 35 USC 103(a) as being unpatentable over Townsend in view of Midorikawa (U.S. Patent No. 6,332,629) ("Midorikawa");

(5) rejected claim 20 under 35 USC 103(a) as being unpatentable over Townsend in view of Midorikawa, and in further view of Segrave (U.S. Patent No. 3,324,719) ("Segrave"); and

(6) rejected claims 21-23 under 35 USC 103(a) as being unpatentable over Townsend in view of Vilim et al. (U.S. Patent No. 5,745,382) ("Vilim").

In response to Item 1 above, Applicant has now amended claim 18. Applicant believes that amended claim 18 is now clear and definite, and reconsideration of this rejection is respectfully requested.

In response to Items 2 through 6 above, Applicant respectfully disagrees with the Examiner's rejections, however, Applicant has now amended claim 1 in order to more clearly define the present invention and to further distinguish it from the prior art.

The present invention is directed to apparatus for pretensioning a tension-element drive powered by a drive motor, wherein the drive motor is used to both pretension the tension-element (i.e., so that the tension-element is properly tensioned) and to drive the tension-element so as to perform work (e.g., to move an end effector on a robotic system). Thus, the torque of the drive motor is used to both pretension the tension-element and to drive the tension-element.

This use of the drive motor to both pretension the tension-element and to drive the tension-element is clearly reflected in amended claim 1 (and hence dependent claims 2-5 and 14-23), i.e., by the language "apparatus for pretensioning a tension-element drive *powered by a drive motor* having a rotary output shaft, the apparatus comprising an initiation mechanism that selectively couples *the rotary output shaft to pretension the tension-element*" (italics added for emphasis).

The Townsend patent is discussed and distinguished in the specification, beginning at the bottom of page 2 and continuing to the top of page 5. The pretensioner of the Townsend patent is of the "popular split-pinion" type where "the two halves of the motor pinion are allowed briefly during pretensioning to counter-rotate in the relative direction that eliminates cable slack and induces pretension" (pg. 3, lines 19-22). In the pretensioner of the Townsend patent, a cylindrical sleeve carried on one end of a pinion shaft is the counter-rotating element.

As discussed in the background section of the present patent application, the prior art system of the Townsend patent has many drawbacks. It is, first, "not automatic or easily

automated" (pg. 3, line 2). It also must deal with the "capstan effect". Windings of the cable on a capstan (here, the split pinion) will restrict the transmission of tension if the cable straddles the split to any appreciable degree. Cable position adjustment, particularly if a scalloped pinion is used, is another problem.

The specification of the present patent application also notes problems with the cable being stressed into an elliptical cross-section at the pinion wrap, and reverting to a circular cross-section at free runs, producing cable damage. Another problem of these prior art cable pretensioners is that they impose and store a pretension on only a small, local length of the cable, with the "rest of the 90% of cable unaffected" (pg. 4, line 20). Further, known manual, non-automatic cable pretensioning systems also require skilled and knowledgeable users (pg. 4, line 29 et seq.).

The present invention, as defined by claim 1 and the other pending claims, differs fundamentally and very importantly from such prior art pretensioners (as exemplified by the Townsend patent) in that the drive motor itself powers the pretensioning.

In the Townsend patent, there is a motor 14, and it does rotate pinion shaft 18 and pinion sleeve 20 carried on the shaft 18 to cause the cable to travel, and transmit power. However, the motor 14 in the Townsend patent has nothing to do with pretensioning.

As is clear from the Townsend patent, to adjust the pretension, one inserts a torque wrench (not shown) in hex recess 54 to turn the worm 52 mounted in a boss 34 of sleeve 20. The worm 52, in turn, engages and rotates gear teeth 60 (Fig. 3)

formed on a reduced shoulder 32 of the pinion shaft 18 (Col. 3, line 48 to Col. 4, line 23).

This is a manual pretensioning process. It does not use a drive motor to pretension, as claimed in the present patent application. It is not automatic, as claimed in claim 2 of the present patent application. And the worm 52 is not the claim "initiation mechanism" that "selectively couples the rotary output shaft to pretension...". The point of the present invention is that it uses the power of the drive motor to automatically pretension the cable. No wrenches are needed. No worm gear as described in the Townsend patent is needed.

The Townsend patent teaches no element that couples Applicant's output shaft 2 of motor 1 in a way that allows the torque produced by the motor to pretension cable 5, 6, let alone one that does so selectively through the action of an initiation mechanism (claim 1), automatically (claim 2), or semi-automatically (claim 3). The Townsend patent is also completely devoid of any teaching of a motor controller (claim 15) or encoder and processor (claim 16) that implement this automatic or semi-automatic pretensioning. Nor does the Townsend patent teach any initiation mechanism (12, 13, 14) as described and claimed. (The initiation mechanisms shown in Figs. 6 and 7 are described on the bottom of page 9 to page 11, line 8.)

In view of the foregoing, Applicant believes that claim 1, and its dependent claims 2-5 and 14-23 are allowable over Townsend.

Midorikawa, Segrave and Vilim are not believed to remedy the aforementioned deficiencies of Townsend.

In view of the foregoing, Applicant believes that this patent application is in condition for allowance, and allowance thereof is respectfully requested.

In the event that any fees may be required in this matter, please charge the same to Deposit Account No. 16-0221.

Thank you.

Respectfully submitted,



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